Climate Change and Human Health Literature Portal

National Institute of
Environmental Health Sciences

Statistical modeling reveals the effect of absolute humidity on dengue in Singapore

Author(s):	Xu HY, Fu X, Lee LKH, Ma S, Goh KT, Wong J, Habibullah MS, Lee GKK, Lim TK, Tambyah PA, Lim CL, Ng LC
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Abstract:

Weather factors are widely studied for their effects on indicating dengue incidence trends. However, these studies have been limited due to the complex epidemiology of dengue, which involves dynamic interplay of multiple factors such as herd immunity within a population, distinct serotypes of the virus, environmental factors and intervention programs. In this study, we investigate the impact of weather factors on dengue in Singapore, considering the disease epidemiology and profile of virus serotypes. A Poisson regression combined with Distributed Lag Non-linear Model (DLNM) was used to evaluate and compare the impact of weekly Absolute Humidity (AH) and other weather factors (mean temperature, minimum temperature, maximum temperature, rainfall, relative humidity and wind speed) on dengue incidence from 2001 to 2009. The same analysis was also performed on three sub-periods, defined by predominant circulating serotypes. The performance of DLNM regression models were then evaluated through the Akaike's Information Criterion. From the correlation and DLNM regression modeling analyses of the studied period, AH was found to be a better predictor for modeling dengue incidence than the other unique weather variables. Whilst mean temperature (MeanT) also showed significant correlation with dengue incidence, the relationship between AH or MeanT and dengue incidence, however, varied in the three sub-periods. Our results showed that AH had a more stable impact on dengue incidence than temperature when virological factors were taken into consideration. AH appeared to be the most consistent factor in modeling dengue incidence in Singapore. Considering the changes in dominant serotypes, the improvements in vector control programs and the inconsistent weather patterns observed in the sub-periods, the impact of weather on dengue is modulated by these other factors. Future studies on the impact of climate change on dengue need to take all the other contributing factors into consideration in order to make meaningful public policy recommendations.

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Resource Description

Exposure : ☒

weather or climate related pathway by which climate change affects health

 Meteorological Factors, Precipitation, Temperature

Geographic Feature: ☒

resource focuses on specific type of geography

Ocean/Coastal, Tropical

Geographic Location: ☒

resource focuses on specific location

Non-United States

Non-United States: Asia

Asian Region/Country: Other Asian Country

Other Asian Country: Republic of Singapore

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Dengue

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☒

type of model used or methodology development is a focus of resource

Outcome Change Prediction

Resource Type: ☒

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☒

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content